

May 1, 1951

C. D. McDONALD
BALANCED DOOR MECHANISM

2,551,032

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2 Sheets-Sheet 1

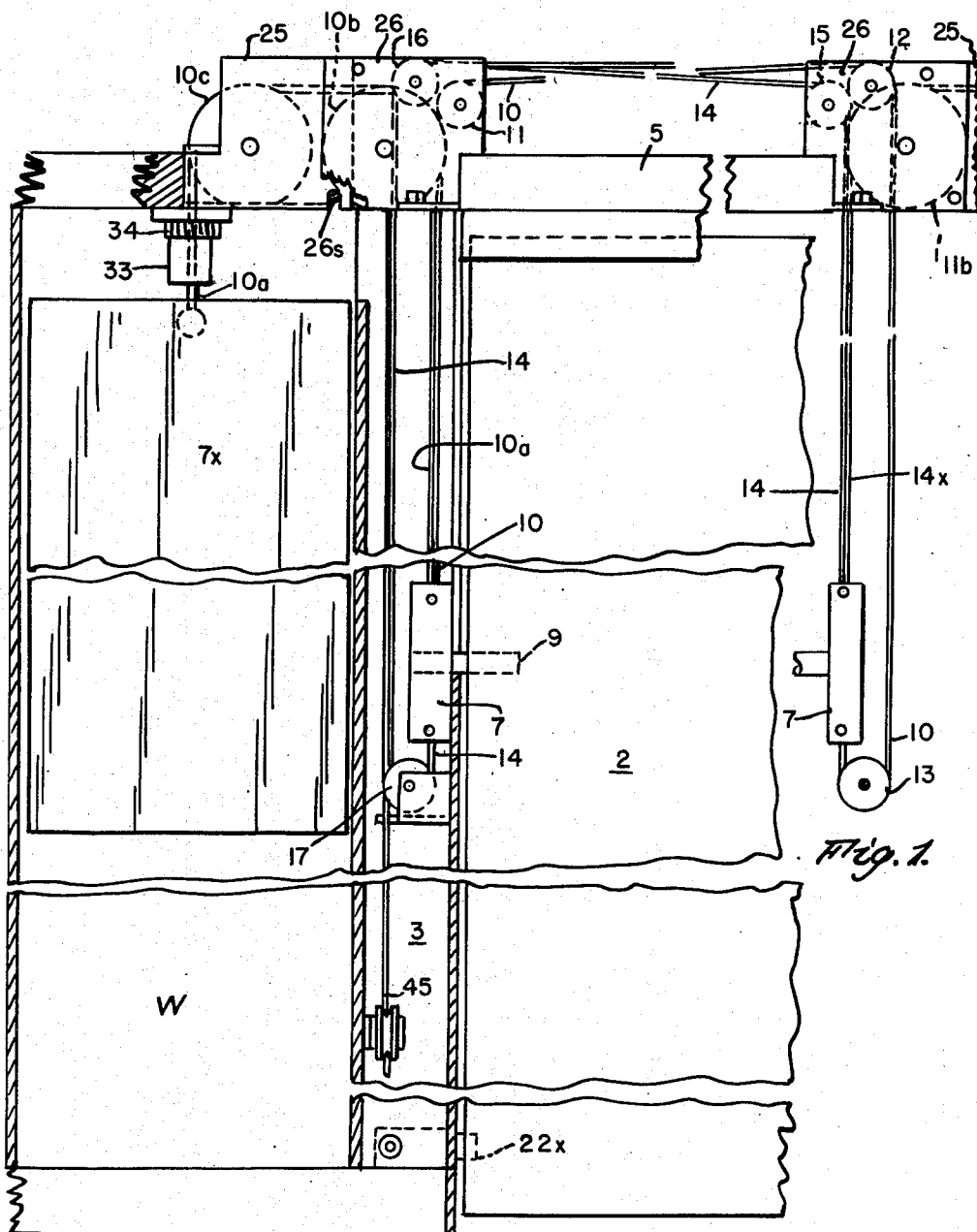


Fig. 1.

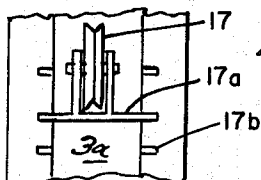


Fig. 6.

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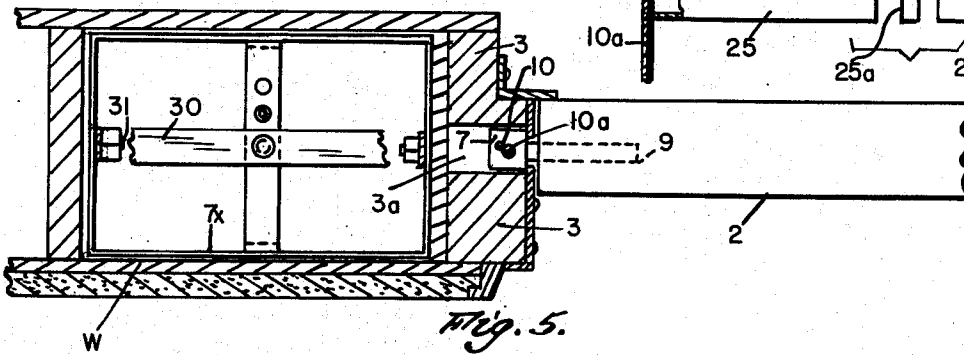
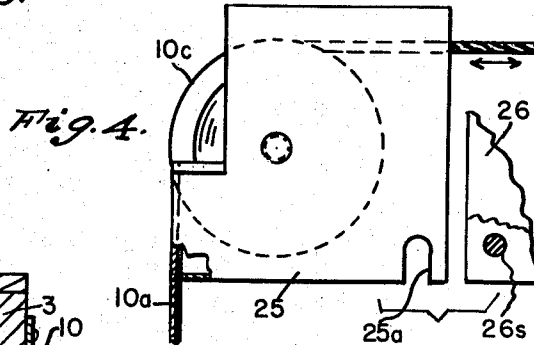
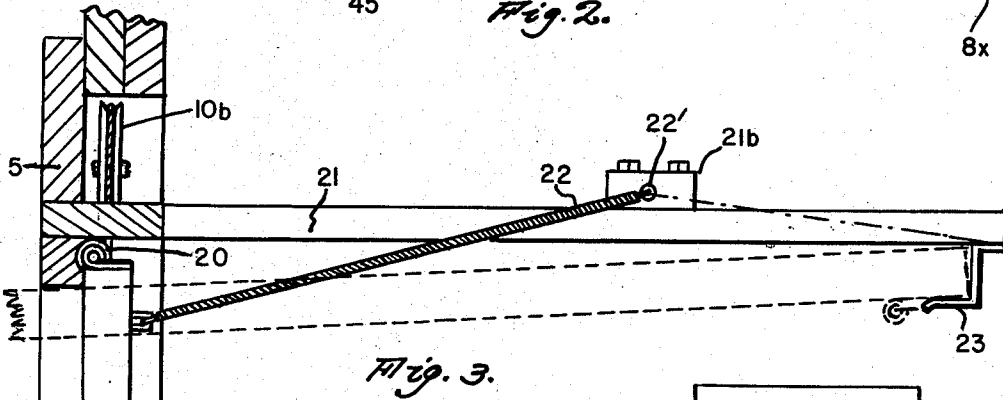
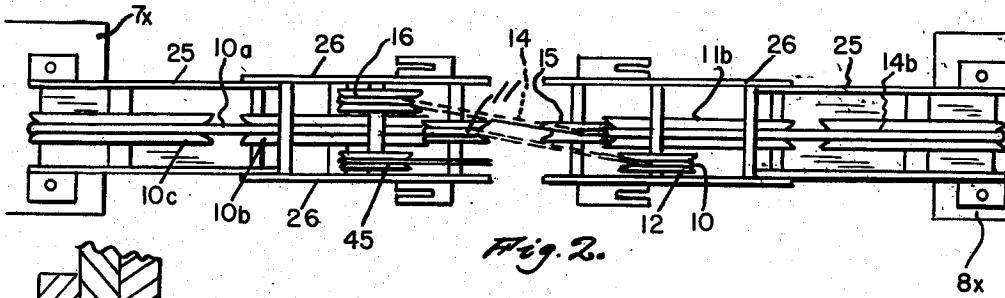
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UNITED STATES PATENT OFFICE

2,551,032

BALANCED DOOR MECHANISM

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Application May 12, 1947, Serial No. 747,391

2 Claims. (Cl. 242—190)

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This invention is an improved mechanism of automatic door apparatus of the kind shown in my copending application Ser. No. 716,013, now Patent No. 2,512,804, and others I have filed.

This door structure involves a door, such as for garages, which is suspended in a slightly over-balanced manner so that it will automatically rise from a vertical, closed position to a nearly horizontal, over head position, and can be easily drawn down to the closed position at will.

It is an object of the instant invention to provide a novel system of pulley sets to facilitate the suspension of the given door in its doorway frame and provide for the ready installation of a counter weight and its respective pulley device either immediately in a jamb well and header, or at a desired position remote from the door jamb as may be necessary in numerous cases of door installation. And in this connection it is an object to provide an overhead, pulley box structure of sectional embodiment including complementary casings adapted to be firmly interconnected in compact association for use when the weight well is close to or in the jamb or may be distally mounted; the separate casings being designed to be compactly packed, when knocked down, in a can which, when loaded with sand or other suitable material, constitutes a poise for lifting the door (two of said cans being used in combination for the lifting purpose).

A further object of the invention is to provide a simple, practical and effective means having the dual functions of giving the closed door, when unlocked, an initial, inward opening pull at its top while it is at the same time automatically raised by the connected poise means (the sand cans), and of back snubbing the inner end of the nearly horizontal or lifted door as it reaches its fully open position, and which snubbing effect constitutes a favor-force when the raised door is being again and manually pulled to its closed, vertical position.

The invention resides in certain advancements in this art as set forth in the ensuing disclosure and has, with the above, additional objects and advantages as will be made manifest in the following description of the construction, combinations and means, and details thereof, and of the manner of operation relative to the herewith illustration embodiment; it being understood that modifications, variations and adaptations may be resorted to within the scope, spirit and principles of the invention as it is claimed in conclusion hereof.

Figure 1 is a front elevation and partial section of the (broken away) door and its doorway frame and control mechanism. Figure 2 is a plan of the pulley and cable mechanism whose

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boxes are diagrammed as in close position to facilitate disclosure. Figure 3 is a vertical, cross-section of the frame header and elevation of an edge of the door in its closed position, and its top connected, pull back-snubber device. Figure 4 is a side elevation of a separable casing of the pulley system, as for remote installation. Figure 5 is a horizontal section of one (the left hand side) of the frame jambs, and a plan of the top edge of the closed door (broken away). Figure 6 is detail view in elevation of the adjustable pulley bracket.

Herein is shown the left hand side portion of a garage door 2 mounted for bodily vertical and tilting movement between right hand and left hand jambs, only one of which is shown at 3, having a connecting header 5 along which the top of the vertical, closed door stops. Each jamb has a vertical guide slot 3a, Fig. 5, and, generally, outwardly of said slot the jamb has a weight well W.

As the jambs are substantially duplicate, description of one will suffice for both. In each slot 3a is a relative, vertical slide 7 which has a trunnion 9 mounted in the vertical adjacent edge of the door 2; the axis of the trunnion being somewhat above the horizontal center line of the door so that the lower part of the door (below the line of the trunnion axis) slightly over weighs the door part above the axis thereby causing the bottom end of the door to constantly tend to tip down on the supporting trunnions. Other balancing means may be provided.

From slide 7 a cable 10 rises to a pulley 11 and thence along the header 5 to a pulley 12 above the (not shown) right hand jamb and then down to a fixed axis pulley 13 and around it up to the bottom of the right hand slide 7, Fig. 1. It will be seen that when the slides 7—7 rise in synchronization the cable 10 from the left hand side pays out to the pulley 13 so that the connected cable 10 goes up with the right hand slide 7.

In the same manner of hook-up a cable 14 pays out from the right hand slide 7 to a header pulley 15 and thence to a distal pulley 16 at the top of the left jamb 3 and then down in a bight around a pulley 17 and up to the left slide 7. Thus the slides are reined for synchronous actions; going up or going down as the door trunnions rise or descend.

To motivate the door automatically in upward movement by way of the trunnion slides 7—7 a motor device is hitched to the slides in a direct manner to concurrently apply a substantially equal lifting moment to the slides. Gravity is here used as the motivating force. Directly hitched to the slide 7 of the left jamb is a power cable 10a which rises to a tandem pair of guide

pulleys 10b—10c and directly connects to a suitable weight such as a sand loaded can 7x vertically movable in the well W at jamb 3. In a like manner a cable 14x in a well at the right jamb connects with the top of a weight 8x and extends up to and from a pulley 14b of a tandem pair and connects to the top of the respective right jamb slide 7. The combined weight of the equal weights 7x and 8x is somewhat more than that of the door 2 and its slides 7—7 and other attachments, so that if the door is free to rise the force of gravity on the weights will act equally on the slide cables 10a and 14x and lift the door to overhead position.

The constant effort of the weights presses a roller 20, mounted on the top of the door, up against a fixed overhanging track 21 extending inward from the header 5 and reacting to cause the top of the door to take a horizontal path to full open, nearly horizontal position under the header.

A feature of the instant embodiment of the invention resides in a double function, elongate tensionable elastic in the form of a helical spring 22, Fig. 3, one end of which is hitched pivotally at 22' to the track block 21b and the other end of which is hitched at 22x to the door at a point on its back face and desirably below the top edge of the door whose bottom is normally locked by a releasable latch 22x of suitable type and thus stops the top of the door from being tilted inward about the trunnions 9 of the slides 7, by the spring 21. As the door moves to vertical or closed position the spring is put under enough tension to instantly initiate inward tilt of the door top just as soon as the latch 22x releases the bottom of the door so that it, the door, can tilt.

The second function of the starting spring 22 is to check or snub the top edge of the door as it approaches the full open, horizontal position, dotted lines, Fig. 3; the length and position of hitch of the spring ends being such that as the inner, top end of the door approaches a safety stop 23 the spring loops around the door edge and forms a tensioned bridle bringing the door motion to a gradual stop. Conversely, the tensioned, looped spring 22 will aid in starting the door bodily back to the closed position—to overcome its inertia.

The operation of the door and its weights is obvious from the above.

It frequently happens that it will be desirable to mount the weights, or either of them, in a more convenient location than in or close to the jambs of the given doorway frame but still retain the pulleys to which the synchronizing and weight cables rise directly from the slides 7—7; these pulleys being marked 10b and 11b being coordinate to respective tandem pulleys 10b and 14b. To facilitate the installation of the outer pulleys 10c and 14b, or either of them, at a position remote from the door jambs and at which the weights 7x—8x are to be suspended from said pulleys, each of these weight pulleys is mounted in its own casing 25 which is constructed so as to be readily solidly hitched to or easily disconnected from a respective casing 26 in which say the pulley 10b (or 11b) of a tandem pair is journaled, as also is the respective smaller synchronizing cable pulleys, as 11 and 16 (for the left jamb) or the smaller pulleys 12 and 15, of the right jamb assembly as clearly shown in Fig. 2. The said casing 25 is provided with a wall hook part 25a adapted to be easily hooked onto a cross stay 25b in the lower corner of the casing 26 as the casing

25 is telescoped for firm interfit in its respective casing 26; the combined casings constituting a housing or box for the full set of pulleys for either the left or the right jamb cable hook-up; that is, the pulley boxes are duplicate for right or left installation. If a weight 7x (8x) is to be hung remotely from its respective door edge, then the respective casing 25 is unhooked from its respective, jamb position casing 26 and mounted in a convenient position vertically over its weight, at the remote place.

The separated casings 25 and 26, with other structural elements such as the jambs and attachments are all adapted to be packed for shipment and storage in the empty cans 7x—8x, for economical packaging and transportation.

Door opening and closing means are set forth in the previously mentioned application, and of which cable 45 herein is only a part.

When the disassembled parts are knocked down for packing in the empty cans 7x and 8x cable attaching bars 30 at the tops of the cans are freed from their fastening screws 31 and removed to clear the open tops of the cans.

To provide for reasonable change of bight-lengths in the cables 10 and 14 as the doors are installed, the pulleys 13 and 17 are mounted in respective brackets 17a, Fig. 6, which are adapted to be set in one or another of selective grooves 17b provided at different heights in the walls of the jamb slots 3a.

Means are provided to yieldably arrest the door 2 as it comes into a vertical or closed position in the doorway, and to hold it at proper position for reception of the automatic latch 22x. On the cable 10a, Fig. 1, is an adjustable bumper 33, which, as the door drops to closed position, will engage a cushion 34 fixed to the adjacent bottom face of the frame header and thereby stop the door and suspended weights with a gentle action.

The track block 21b is adjustable to desired position on the track 21 to suitably tension the booster spring 22.

What is claimed is:

1. A housing for a system of wheel devices and including a pair of assembly boxes each composed of parallel side walls fixed together by cross-fasteners and each being open from end to end for clearance of parts of the devices operative therein; the said boxes having mutually intertelescoping vertical, contiguous ends which fit from top to bottom for stabilization when installed in close assembled relation.

2. The structure of claim 1, and in which one of the boxes has indentations in the bottom edges of its side walls and which are adapted to hook onto an adjacent one of said fasteners.

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